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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/045,542 | 10/26/2001 | Mrinal Kanti Das | 5308-157IP2 | 3570 |

20792 7590 11/21/2002

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| EXAMINER |
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BARR, MICHAEL E

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| ART UNIT | PAPER NUMBER |
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1762

DATE MAILED: 11/21/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/045,542

Applicant(s)

DAS ET AL.

Examiner

Michael Barr

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2-4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 8, 13, and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 cites the limitation of heating "as a part of another processing step". It is not clear in the claim as to what is meant by "another processing step". Another with respect to what?

Claim 13 cites the limitation of "high temperature". "High" is a relative term which renders the claim vague and indefinite since there is no clear definition provided to show what temperatures are considered to be high.

Claim 16 cites the limitation of "a contact anneal". It is not clear as to what is meant by a "contact anneal". Does this merely refer to the hydrogen contacting the substrate during the anneal? The examiner is prosecuting the claim with this interpretation.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

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such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2000-252461 by Arai et al. ("Arai") in view of the article by Xu et al. ("Xu").

Arai teaches making a MOS semiconductor device where a silicon carbide layer, on a non-SiC surface, is provided with a gate oxide or nitride layer on its surface, which is then annealed in a hydrogen atmosphere at 600-1600°C for 10 seconds-3 hours, where the hydrogen atmosphere can be a mixture of hydrogen gas and inert gas with the mixture being 05.5-100% hydrogen, where the SiC can be a 4H polytype SiC (Paragraphs 003, 006-008, 0016-0018). Arai teaches that the MOS device can be on a printed circuit (Paragraph 001).

Arai does not teach that the oxide or nitride layer is a nitrided oxide layer. However, the teaching of Arai that the layer can be an oxide or nitride on the SiC would have suggested to one skilled in the art that a mixture of the two would have also provided suitable results in the device of Arai. Xu teaches making a MOS semiconductor device, similar to that of Arai, wherein a silicon carbide layer is provided with an oxide layer on its surface, where a nitrided oxide layer is preferred over an oxide layer, since the nitrided layer improves the interface qualities of the oxide layer with the SiC, as opposed to the oxide layer alone, where the layer can be applied by forming an oxide layer and then nitriding/annealing with N₂O, or by oxidizing in pure N₂O and then further annealing (see Introduction and Experiments sections). It would have been an obvious modification to Arai to provide a nitrided oxide layer on the SiC of the MOS semiconductor device in the manner taught by Xu, in order to improve the interface density with the SiC, as is taught by Xu and since it is taught by Arai that both oxide and nitride layers are

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used in the process, which would have suggested to one skilled in the art that a mixture of the two would have also provided suitable results in the device of Arai.

Arai and Xu do not teach annealing with hydrogen concurrently with the nitriding process. However, the performance of two steps simultaneously, which have previously been performed in sequence, is considered to be obvious (*In re Tatincloux* 108 USPQ 125).

Therefore, it is the examiner's position that the performance of the hydrogen annealing and nitriding, in Arai and Xu, simultaneously would have been an obvious modification, with the expectation of providing the desired nitriding and annealing results.

With regards to Claim 13, these limitations merely read on typical semiconductor device use in an air environment, which contains hydrogen.

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Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Barr whose telephone number is 703-305-7919. The examiner can normally be reached on Monday-Thursday 6:00 am-4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on 703-308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 or 703-305-5408 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Michael Barr
Primary Examiner
Art Unit 1762

MB
November 12, 2002